- 107 -

WE CLAIM:

1. Sample collection device comprising an inert collection matrix capable of adsorbing or absorbing a fluid sample, and a solid support, wherein the inert matrix is affixed to an area of the solid support.

2. A device according to claims 1, wherein the collection matrix is selected from the group consisting of aragonite, aluminium hydroxide, titania, glucose, Starch "A", Starch "B", glucodin, cellulose powder/granules, fibrous cellulose, hydroxy butyl methyl cellulose, vegetable flour or mixtures thereof

3. A device according to claims 2, wherein the vegetable flour is selected from the group consisting of rice, maize, wheat, soy, rye and corn flour, or mixtures thereof.

4. A device according to any one of the preceding claims, wherein the collection matrix is fibrous cellulose.

5. A device according to claim 4, wherein the fibrous cellulose matrix is modified by oxidation and/or acid hydrolysis.

6. A device according to any one of the preceding claims, further comprising, on or within the matrix, one or more pre-calibrated selected analytes as internal standard.

7. A device according to claim 6 wherein the pre-calibrated analytes are represented by or selected from the sets:
Li, Na, Mg, Al, P, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Rb, Sr, Mo, Cd, Sn, Sb, Te, Ba, La, Ce, Eu, Dy, Yb, Hg, Tl, Pb, Bi, Th and U;
Li, B, Mg, Al, Si, P, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ge, As, Se, Sr, Y, Zr, Mo, Ag, Cd, Sn, Sb, Ba, La, Ce, Hf, Hg, Pb and U or
Li, Na, Mg, Al, P, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Rb, Sr, Mo, Cd, Sn, Sb, Te, Ba, La, Ce, Eu, Dy, Yb, Hg, Tl, Pb, Bi, Th and U.

8. A device according to any one of the preceding claims, further comprising a test sample.

9. A device according to claim 8, wherein the support comprises a bar-code incorporating information on the sample.

10. A device according to any one of the preceding claims, further comprising an integral lancing member, capable of piercing skin or tissue, to aid in the collection and application of a sample to the inert matrix.

11. A device according to claim 10, wherein the lancing member is mounted adjacent to, within or below the area of inert matrix.

12. A device according to claim 10 or claim 11, further comprising a guiding channel in the inert matrix, to guide the lance when the lance is disposed below the inert matrix area.

13. A device according to any one of the preceding claims, further comprising an integral or separate cover sheath, which covers the matrix.

14. A sample collection device having multi-layer construction wherein the collection matrix layer is sandwiched between two supporting layers, one of said supporting layers having an opening, which exposes an area of the collection matrix.

15. A device according to any one of the preceding claims, wherein the sample is a fluid sample selected from body fluids, oils and water.

16. A device according to claim 15, wherein the body fluid is selected from whole blood, urine and sweat.

17. Method of detecting simultaneously a plurality of elements in a fluid sample adsorbed onto or into an inert collection matrix, comprising:

(i) exposing the sample to high energy radiation capable of ionising at least a portion of the sample, and

(ii) detecting plurality of elements in the ionised portion of the sample by mass spectrometry.

18. Method of quantifying simultaneously a plurality of elements in a fluid sample adsorbed onto or into an inert collection matrix, comprising:

(i) exposing the sample to high energy radiation capable of ionising at least a portion of the sample;

(ii) measuring quantity of a plurality of elements in the ionised portion of the sample by mass spectrometry;

(iii) measuring quantity of ionised portion of sample, and

(iv) determining quantity of the plurality of elements in the sample with reference to the quantity of ionised portion of the sample.

19. Method of quantifying simultaneously a plurality of elements in a fluid sample adsorbed onto or into an inert collection matrix having an internal standard applied thereto, comprising:

(i) exposing the sample to high energy radiation capable of ionising at least a portion of the sample and a portion of said internal standard;

(ii) measuring quantity of a plurality of elements in the ionised portion of the sample by mass spectrometry;

(iii) measuring quantity of ionised internal standard in the ionised portion of the sample by mass spectrometry, and

(iv) determining quantity of the plurality of elements in the sample with reference to quantity of ionised internal standard.

20. Method of quantifying simultaneously a plurality of elements in a fluid sample adsorbed onto an inert collection matrix, comprising:

(I) introducing into the fluid sample a known quantity of a measurable internal standard

(II) exposing the sample to high energy radiation capable of ionising at least a portion of the sample and the internal standard;

(iii) measuring quantity of a plurality of elements in the ionised portion of the sample by mass spectrometry;

(iv) measuring quantity of ionised internal standard in the ionised portion of the sample by mass spectrometry, and

(v) determining quantity of the plurality of elements in the sample with reference to quantity of ionised internal standard.

21. Method of quantifying simultaneously a plurality of elements in a fluid sample adsorbed/absorbed onto or into an inert collection matrix comprising:

(I) exposing the sample to high energy radiation capable of ionising at least a portion of the sample;

(II) measuring quantity of a plurality of elements in the ionised portion of the sample by mass spectrometry;

(iii) exposing a matrix-matched Certified Reference Material (CRM) to high energy radiation capable of ionising at least a portion of the CRM;

(iv) measuring quantity of ionised CRM in the ionised portion of the sample by mass spectrometry, and

(v) determining quantity of the plurality of elements in the sample with reference to the CRM.

22. Method of quantifying simultaneously a plurality of elements in a fluid sample supported on an impermeable substrate, comprising:

(I) exposing the sample to high energy radiation capable of ionising at least a portion of the sample;

(II) measuring quantity of a plurality of elements in the ionised portion of the sample by mass spectrometry;

(iii) exposing a matrix-matched Certified Reference Material (CRM) to high energy radiation capable of ionising at least a portion of the CRM;

(iv) measuring quantity of ionised CRM in the ionised portion of the sample by mass spectrometry, and

(v) determining quantity of the plurality of elements in the sample with reference to the CRM.

23. A method according to claim 19 or claim 20, wherein the internal standard is selected from the group consisting of Li, Na, Mg, Al, P, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Rb, Sr, Mo, Cd, Sn, Sb, Te, Ba, La, Ce, Eu, Dy, Yb, Hg, Tl, Pb, Bi, Th and U.

24. A method according to claim 19 or claim 20, wherein the internal standard is selected from the sets:

Li, Na, Mg, Al, P, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Rb, Sr, Mo, Cd, Sn, Sb, Te, Ba, La, Ce, Eu, Dy, Yb, Hg, Tl, Pb, Bi, Th and U;

Li, B, Mg, Al, Si, P, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Sr, Y, Zr, Mo, Ag, Cd, Sn, Sb, Ba, La, Ce, Hf, Hg, Pb and U or

Li, Na, Mg, Al, P, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Rb, Sr, Mo, Cd, Sn, Sb, Te, Ba, La, Ce, Eu, Dy, Yb, Hg, Tl, Pb, Bi, Th and U.

25. A method according to claim 21 or claim 22, wherein the CRM is selected from the group consisting of SARM 1, 3 and 46, and SY-2 .

26. A method according to any one of claims 17 to 24, wherein the inert collection matrix is part of a sample collection device according to any one of claim 1 to 14.

27. A method according to any one of claims 17 to 26, wherein the fluid sample is selected from body fluids, oils and water.

28. A method according to claim 27, wherein the body fluid is selected from whole blood, urine and sweat.

29 A method according to claim 28, wherein the sample is whole blood and sample size is about 50 µl to about 100 µl.

30. A method according to claim 28, wherein the sample size is about 50 µl or less.

31. A method according to any one of claims 17 to 30, wherein the high energy radiation is UV laser radiation.

32 A method according to claim 31, wherein the laser radiation is a component of Inductively Coupled Plasma-Mass Spectrometer (ICP-MS).

33 A method according to claim 32, wherein the mass spectrometer is selected from quadrupole and Time-of-Flight (TOF).

34 A method according to any one of claims 17 to 33, wherein the sample is exposed to radiation for a period of from about 10 seconds to about 120 seconds.

35. A method according to any one of claims 17 to 34, wherein the elements to be detected and/or quantified are selected from dietary trace elements, toxic elements and markers of pollution or wear and tear.

36. A method according to any one of claims 17 to 34, wherein the matrix or the support comprise one or more wells or indentations to accommodate the fluid sample.

37. A method of collecting a fluid sample for mass spectrometry analysis of multiple element content comprising the application of the sample to an inert matrix having a low background element content, wherein the matrix is selected from the group consisting of aragonite, aluminium hydroxide, titania, glucose, Starch "A", Starch "B", glucodin, cellulose powder/granules, fibrous cellulose, hydroxy butyl methyl cellulose, vegetable flour or mixtures thereof.